



## Complete Summary

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### GUIDELINE TITLE

Management of asthma.

### BIBLIOGRAPHIC SOURCE(S)

Singapore Ministry of Health. Management of asthma. Singapore: Singapore Ministry of Health; 2002 Jan. 58 p. [53 references]

## COMPLETE SUMMARY CONTENT

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INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT

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## SCOPE

### DISEASE/CONDITION(S)

Asthma

### GUIDELINE CATEGORY

Management  
Treatment

### CLINICAL SPECIALTY

Family Practice  
Internal Medicine  
Pediatrics

### INTENDED USERS

Allied Health Personnel  
Physicians  
Respiratory Care Practitioners

## GUIDELINE OBJECTIVE(S)

To present evidence-based clinical practice guidelines on practical aspects of asthma management relevant to Singapore

## TARGET POPULATION

Patients with asthma in Singapore

## INTERVENTIONS AND PRACTICES CONSIDERED

Patient Education

Environmental Allergen Avoidance

Pharmacological Management (Stepped Care Approach Based on Severity of Asthma)

1. Inhaled corticosteroids
  - Becotide metered dose inhaler (MDI) (beclomethasone dipropionate)
  - Becloforte MDI (beclomethasone dipropionate)
  - Flixotide MDI (fluticasone propionate)
  - Flixotide Accuhaler (fluticasone propionate)
  - Pulmicort Turbuhaler (budesonide)
2. Long-acting inhaled beta-2-agonists
  - Serevent MDI
  - Serevent Accuhaler
  - Oxis Turbuhaler
3. Long-acting oral beta-2-agonists
  - Bambec (bambuterol)
4. Combination drugs
  - Seretide Accuhaler (salmeterol + fluticasone)
  - Evohaler MDI (salmeterol + fluticasone)
  - Symbicort Turbuhaler (formoterol + budesonide)
5. Oral steroids, such as prednisolone
6. Methylxanthines, such as sustained-release theophylline
7. Leukotriene modifiers
  - Singulair (Montelukast)
  - Accolate (Zafirlukast)
8. Short-acting inhaled beta-2-agonists
  - Ventolin (MDI)
  - Bricanyl turbuhaler
9. Sodium cromoglycate/nedocromil sodium
10. Ipratropium bromide as adjuvant to beta-agonist
11. Use of aerosol holding chambers (spacer devices) with metered dose inhalers (MDIs), especially in children.

Management of Acute Exacerbations

Management of Asthma in Pregnancy

Written Asthma Action Plan

Referral to Specialists

Hospital Admission

#### MAJOR OUTCOMES CONSIDERED

- Morbidity and mortality due to asthma
- Quality of life
- Asthma symptoms (e.g., wheezing, dyspnea, cough)
- Peak expiratory flow (PEF)
- Hospital admission
- Emergency room visits or physician visits
- Days off from work

### METHODOLOGY

#### METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Secondary Sources)  
Searches of Electronic Databases

#### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

#### NUMBER OF SOURCE DOCUMENTS

Not stated

#### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

#### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level Ia: Evidence obtained from meta-analysis of randomised controlled trials.

Level Ib: Evidence obtained from at least one randomised controlled trial.

Level IIa: Evidence obtained from at least one well-designed controlled study without randomisation.

Level IIb: Evidence obtained from at least one other type of well-designed quasi-experimental study.

Level III: Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies.

Level IV: Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities.

#### METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses  
Systematic Review

#### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

#### METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

#### RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Grades of Recommendation

Grade A (evidence levels Ia, Ib): Requires at least one randomized controlled trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation.

Grade B (evidence levels IIa, IIb, III): Requires availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation.

Grade C (evidence level IV): Requires evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.

Good Practice Points: Recommended best practice based on the clinical experience of the guideline development group.

#### COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

#### METHOD OF GUIDELINE VALIDATION

Not stated

#### DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not applicable

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

Excerpted by the National Guideline Clearinghouse (NGC)

Each recommendation is rated based on the level of the evidence and the grades of recommendation. Definitions of the level of evidence (Ia-IV) and the grades of recommendations (A, B, C, and GPP) are defined at the end of the Major Recommendations field.

#### General Principles of Asthma Management

##### Education Motivation

A - All doctors treating asthma patients should provide patient education to aid behavior change. (refer to Tables 3 and 4 in the original guideline document for details) (Grade A, Level Ia)

##### Management of Environmental Triggers

A - Asthma symptoms, peak expiratory flow rate, and bronchial hyper-responsiveness improve when patients avoid environmental allergens to which they are allergic (Platts-Mills et al, 1982). (Grade A, Level Ia)

A - Food allergens are NOT a common precipitant of asthma symptoms. (Grade A, Level Ia)

A - Special allergen immunotherapy may be considered in patients whose asthma is driven by allergic triggers, and other forms of therapy do not provide sufficient control (Abramson, Puy, & Weiner, 1999). (Grade A, Level IIa)

A - Doctors should advise all asthmatics (children and adults) not to smoke and to avoid environmental exposure to tobacco smoke where possible (Jindal, Gupta, & Singh, 1994). (Grade A, Level Ia)

GPP - Asthmatics should avoid exertion or exercise outdoors when levels of air pollution are high (pollution standard index [PSI] >100). Increased pollution level is reported to precipitate symptoms of asthma, increase emergency room visits and hospitalization (Chew et al, 1995; Chew et al, 1999). (GPP)

GPP - Annual influenza vaccinations should be considered in patients with moderate and severe persistent asthma. (GPP)

##### Pharmacological Management

C - Drug treatment should be guided by regular assessment of asthma severity and control using a step classification system. (Grade C, Level IV)

Treatment should be instituted at the step corresponding to asthma severity (refer to Figure 1 in the original guideline document for details). The presence of any one of the features of severity is sufficient to place a patient in that category.

### Step-up

If control is not achieved, consider stepping up drug therapy. Prior to stepping up drug therapy, it is important to review patient's device technique, compliance and environmental control such as avoidance of allergens or other trigger factors. The aim is to establish control as soon as possible, then decrease treatment to the least amount of medication necessary to maintain control. A rescue course of prednisolone may be needed for acute exacerbations with stepped up treatment. Patients should avoid or control triggers at each step. All therapy must include patient education (refer to Table 7 in the original guideline document for details).

### Step-down

Treatment should be reviewed every 3 to 6 months. If control is sustained for at least 3 months, a gradual stepwise reduction in treatment may be possible. Discontinuation of long-term preventive treatment with inhaled corticosteroids should be attempted with great caution. After stopping inhaled steroids patients are at an increased risk of severe asthma and even fatal, asthma relapse.

A - Patients with persistent asthma should be given low dose inhaled corticosteroids to improve asthma control. (Grade A, Level I a)

A - Adult asthmatics with symptoms not controlled with 400 to 800 micrograms of inhaled corticosteroids per day should be given long acting beta-2-agonists. (Grade A, Level I a)

B - Doctors should avoid excessive use of short acting beta-2-agonists (>2 units of metered dose inhalers per month or home nebulisation) due to association with risk of asthma death. (Grade B, Level II a)

A - Home nebuliser use is not recommended as it offers no advantage over the use of metered dose inhalers (MDIs) with spacer devices for children with acute asthma. (Grade A, Level I a, I b)

### Management of Acute Exacerbations

GPP - Mild attacks can be treated at home. Beginning treatment at home also avoids treatment delays, prevents exacerbations from becoming severe, and also adds to patients' sense of control over their asthma. (GPP)

### Treatment of Acute Asthma at the Clinic

C - Patients at high risk of dying with asthma require special attention, monitoring and care, particularly intensive education, including advice to seek medical care early during an exacerbation. (Grade C, Level IV)

Risk factors for death from asthma (Ng & Tan, 1999; Abramson et al., 2001):

- Past history of sudden, severe exacerbation
- Prior intubation for asthma
- Two or more hospitalisations for asthma in the past year
- Three or more emergency care visits for asthma in the past year
- Hospitalisation or an emergency care visit for asthma within the past month
- Use of >2 canisters per month of an inhaled, short-acting beta-2-agonist
- Current use of systemic corticosteroids or recent withdrawal from systemic corticosteroids
- Known difficulty perceiving airflow obstruction or its severity
- Comorbidity, such as from cardiovascular diseases or chronic obstructive pulmonary disease
- Serious psychiatric disease or psychosocial problems
- Low socioeconomic status
- Illicit drug use

## Management of Adult Acute Asthma in the Clinic

### Initial treatment:

B - Continuous inhaled, short-acting beta-2-agonist by nebulisation, one dose (e.g., Salbutamol 5 to 10 mg) every 20 minutes for one hour; alternatively, the use of an inhaler (e.g., 20 puffs of Ventolin) plus a holding chamber (spacer device) produces equally effective bronchodilation. (Grade B Level IIa)

A - Addition of ipratropium 0.5 mg in adults to an aerosolised solution of beta-2-agonist has been shown to cause additional bronchodilation, particularly in those with severe airflow obstruction, and to reduce hospitalisation. (Grade A Level Ia)

A - Systemic corticosteroids e.g., prednisolone 40 mg, immediately and repeated for 7 to 10 days for all patients. No "tail" is needed and oral steroids are as rapid and effective as injections. (Grade A Level Ib)

### Written Asthma Action Plan

A - Asthma control can be achieved by self management using a written action plan with or without peak flow monitoring. (refer to Figure 4 in the original guideline document for details) (Grade A, Level Ib)

### Asthma in Pregnancy

B - Asthmatic patients who are pregnant should be managed with inhalation therapy, which is safe and effective in pregnancy. (Grade B, Level IIa)

## Management of Asthma in Children

### Anti-inflammatory Therapy

C - Sodium cromoglycate may be used as the first line drug (Holgate, 1996) for a trial of 4 to 6 weeks in patients with frequent episodic asthma, failing which inhaled steroids should be considered. (Grade C, Level IV)

B - Nedocromil sodium may be used as an alternative to sodium cromoglycate in children >6 years old. It has also been shown to reduce the need for acute care and oral steroids (Szeffler et al., 2000). (Grade B, Level III)

A - Leukotriene receptor antagonists may be considered as an additional therapy in children with chronic asthma (Simons, 2001; Knorr et al., 1999) on moderate dose (200 to 400 micrograms per day) of inhaled steroids. (Grade A, Level Ib)

A - Low dose inhaled corticosteroid is safe (does not retard growth) and effective in children. (Grade A, Level Ia)

A - Inhaled steroids should be given via a spacer device in young children to improve delivery and reduce the incidence of oral candidiasis and hoarseness of voice. (Grade A, Level Ia/Ib)

A - Doctors should consider a combination of long acting beta-agonist and inhaled steroids in children who remain symptomatic on moderate doses of inhaled steroids. (Grade A, Level Ib)

#### Bronchodilator Therapy

A - A beta-2-agonist is the most effective bronchodilator and should be given by inhalation as far as possible. (Grade A, Level Ia/Ib)

During asthma exacerbations, as many as 4 to 8 puffs of salbutamol inhaler or 0.2 to 0.3 puffs/kg may be used (Schuh, et al., 1999). (Level Ia/Ib)

A - Methylxanthines in acute asthma do not provide additional benefit when optimal doses of bronchodilators and steroids are used. (Grade A, Level Ia)

A - Long acting beta-agonists which are safer and more effective, should be considered as long term treatment in place of long acting theophylline (Davies, Brooks, & Devoy, 1998; Nutini, Martini, & Righi, 1998). (Grade A, Level Ia)

A - Long acting bronchodilators cannot be used as rescue medication with the exception of formoterol. Formoterol, a long acting beta-2-agonist with a rapid onset of action, may be used for acute relief of symptoms when indicated (Tattersfield, 2001; Plotnick & Ducharme, 1998). (Grade A, Level Ib)

#### Treatment of Acute Asthma at Home

A - Home nebuliser use is not recommended as it offers no advantage over the use of MDI with spacer for children with acute asthma. (Grade A, Level Ia, Ib)

A - Frequent beta-2-agonist (e.g., Salbutamol MDI 0.2 to 0.3 puffs/kg), should be given at 4 hourly intervals, preferably via a spacer device. Nebuliser therapy is not superior to use of MDI via spacer in acute asthma in children (Robertson et al, 1985). (Grade A, Level Ia, Ib)

#### Treatment of Acute Asthma at Accident and Emergency Department/Outpatient Clinic



A - Early aggressive bronchodilator therapy (beta-2 agonist - Salbutamol/terbutaline plus an anticholinergic e.g., Ipratropium bromide) is crucial in preventing worsening of acute asthma and improving outcome (Plotnick & Ducharme, 1998). (Grade A, Level I a, I b)

#### Definitions:

#### Levels of Evidence

##### I a

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##### I b

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##### II a

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##### II b

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#### Grades of Recommendation

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##### C (evidence level IV)

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GPP (good practice points)

Recommended best practice based on the clinical experience of the guideline development group.

## CLINICAL ALGORITHM(S)

The original guideline contains clinical algorithms for:

- Management of Adult Acute Asthma in the Clinic
- Management of Acute Asthma in Children

## EVIDENCE SUPPORTING THE RECOMMENDATIONS

### REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

#### Benefits of Asthma Management Plan

- Long-term control of asthma symptoms
- Prevent asthma exacerbations
- Maintain normal activity, including exercise and work/school/vacations
- Avoid side effects of asthma drugs (including excessive cost)
- Prevent asthma death
- Maintain normal pulmonary function (optional)

#### Benefits of Long-term Preventive Treatment of Asthma

- Improved quality of life
- Reduced frequency and severity of asthma exacerbations
- Reduced risk of emergency room visits
- Reduced risk of hospital admissions
- Prevent loss of productivity from days missed work/school
- Reduce total cost of asthma treatment in the longer term
- Reduce risk of death from asthma

## Other Benefits

Encourage patient independence and confidence in managing mild acute attacks.

## POTENTIAL HARMS

### Risk of Side Effects of Oral Corticosteroid Medication

- Short-term use may lead to reversible abnormalities in glucose metabolism, increased appetite, fluid retention, weight gain, mood alteration, hypertension, peptic ulcer, and (rarely) aseptic necrosis of femur.
- Long-term use may lead to adrenal axis suppression, growth suppression, dermal thinning, hypertension, diabetes, Cushing's syndrome, cataracts, muscle weakness, and impaired immune function.

### Adverse Effects of Inhaled Steroids

Inhaled steroids are associated with side effects, including hoarseness and oral candidiasis.

## QUALIFYING STATEMENTS

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- These guidelines are not intended to serve as a standard of medical care. Standards of medical care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge advances and patterns of care evolve. The contents of this publication are guidelines to clinical practice, based on the best available evidence at the time of development.
- Adherence to these guidelines may not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care. Each physician is ultimately responsible for the management of his/her unique patient in the light of the clinical data presented by the patient and the diagnostic and treatment options available.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

#### Quality Indicators for Asthma Management

1. Patients who require acute relief medication one or more times a week should be started on inhalation corticosteroid therapy (refer to section 5.4.1 in the original guideline document for details).
2. Asthmatics who present to the clinic with sudden severe episodes of acute exacerbation should be given a one week course of oral corticosteroids.
3. All patients requiring asthma treatment should be given patient education which includes a written asthma action plan.

## Indices of Poor Clinical Outcome Which Require Monitoring

1. Excessive use of inhaled quick relief agents  $\geq 2$  units per month
2. Severe acute exacerbations requiring nebulisation  $\geq 2$  per year
3. Status asthmaticus: failure to improve after treatment with beta-agonists
4. Short bursts of oral steroids  $\geq 2$  per year
5. No patient should be on long term oral corticosteroids in primary care
6. Hospital admission or readmission for asthma

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better  
Living with Illness

### IOM DOMAIN

Effectiveness  
Patient-centeredness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Singapore Ministry of Health. Management of asthma. Singapore: Singapore Ministry of Health; 2002 Jan. 58 p. [53 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

2002 Jan

### GUIDELINE DEVELOPER(S)

National Medical Research Council (Singapore Ministry of Health) - National Government Agency [Non-U.S.]  
Singapore Ministry of Health - National Government Agency [Non-U.S.]

### SOURCE(S) OF FUNDING

Singapore Ministry of Health

### GUIDELINE COMMITTEE

## Singapore Ministry of Health Appointed Workgroup

### COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Workgroup Members: Prof Lim Tow Keang (Chairperson); Clin Prof Tan Cheng Lim; Clin Assoc Prof Wang Yee Tang; Assoc Prof Daniel Goh Yam Thiam; Adj Assoc Prof Lee Bee Wah; Dr Philip Eng; Dr Chay Oh Moh; Dr K Narendran; Dr KN Sin Fai Lam; Dr Chong Phui Nah; Dr Tan Ngiap Chuan; Dr Siaw Tung Yeng

Secretariat: Dr Allen Wang

### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

### GUIDELINE STATUS

This is the current release of the guideline.

### GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Singapore Ministry of Health Web site](#).

Print copies: Available from the Singapore Ministry of Health, College of Medicine Building, Mezzanine Floor 16 College Rd, Singapore 169854.

### AVAILABILITY OF COMPANION DOCUMENTS

None available

### PATIENT RESOURCES

None available

### NGC STATUS

This NGC summary was completed by ECRI on December 19, 2002. The information was verified by the guideline developer on January 29, 2003.

### COPYRIGHT STATEMENT

This NGC summary is based on the original guideline, which is subject to the guideline developer's copyright restrictions. Please contact the Ministry of Health, Singapore by e-mail at [MOH\\_INFO@MOH.GOV.SG](mailto:MOH_INFO@MOH.GOV.SG).

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